Account of Ancient Oriental Methods in Astronomy and Mathematics, in the Turkish Language]. Part 2. Folio. [1887].
H.E. Ghazi Moukhtar Pasha.

Plantamour (Ph.) Des Mouvements Périodiques du Sol. (9e Année.) 8vo. *Genève* 1887. The Author.

Schiaparelli (G. V.) Osservazioni Astronomiche e Fisiche del Pianeta Marte (Mem. 3a). 4to. *Roma* 1886. The Author.

Velschow (F. A.) The Natural Law of Relation between Rainfall and Vegetable Life and its application to Australia. 8vo. *London* 1888. The Author.

Wardle (T.) Royal Jubilee Exhibition, Manchester, 1887. Descriptive Catalogue of the Silk Section. 8vo. *Manchester* [1888]. The Author.

Weihrauch (K.) Neue Untersuchungen über die Bessel'sche Formel und deren Verwendung in der Meteorologie. 8vo. *Dorpat* 1888. The Author.

May 17, 1888.

Professor G. G. STOKES, D.C.L., President, in the Chair.

The Presents received were laid on the table, and thanks ordered for them.

The following Papers were read:—

I. "On the Electromotive Properties of the Leaf of *Dionæa* in the Excited and Unexcited State. No. II." By J. BURDON SANDERSON, M.A., M.D., F.R.S., Professor of Physiology in the University of Oxford. Received April 17, 1888.

(Abstract.)

The author has continued his experimental enquiries, of which the results were communicated to the Royal Society under the same title in 1881. In the introduction to the paper he gives a summary of his previous observations, which led to the conclusion that the property, by virtue of which the excitable structures of the leaf respond to stimulation, is of the same nature with that possessed by the similarly-endowed structures of animals. He then proceeds to state that the main purpose of his subsequent investigations has been to determine the relation between two sets of phenomena which might, in accordance with the language commonly used in animal physiology, be termed respectively those of the "resting current" and of the "action

current" of the leaf, *i.e.*, between the electrical properties possessed by the leaf when stimulated, and those which it displays when at rest. Assuming the excitatory response in the leaf to be of the same nature as the excitatory variation or "action current" in muscle and nerve, the question has to be answered, whether in the leaf the response is a sudden diminution of a previously existing electromotive action (according to the pre-existence theory of du Bois-Reymond), or the setting up at the moment of stimulation of a new electromotive action—in short, whether and in how far the two sets of phenomena are interdependent or the contrary.

An observation recorded in his former paper suggested proper methods. It had been shown that by passing a weak voltaic current through the leaf for a short period in a particular direction, its electromotive properties could be permanently *modified* without loss of its excitability. If it could be shown that the influence of this modification extended to both orders of phenomena, those of rest and of excitation, and that both underwent corresponding changes of character under similar conditions, this would go far to prove that an essential relation existed between them.

Acting on this suggestion, the author has had recourse to modes of experiment similar to those which have been employed during the last few years in the investigation of the newly-discovered "secondary electromotive" phenomena of muscle and nerve (see 'Oxford Biological Memoirs,' vol. 1, part 2). The details of these experiments, made in 1885, are given in the first three sections of the paper. They relate to (1) the more immediate effect of the current as seen in the records of successive galvanometric observations made at regular intervals; (2) the more permanent influence of the current on the electromotive properties of the unexcited leaf, and on its electrical resistance; and (3) the concomitant modification of its behaviour when stimulated.

The general result of these experiments is to show that the two orders of phenomena, the excitatory and those which relate to the resting state, are so linked together that every change in the state of the leaf when at rest conditionates a corresponding change in the way in which it reacts to stimulation—the correspondence consisting in this, that the direction of the response is opposed to that of the previous difference of potential between the opposite surfaces, so that as the latter changes from ascending to descending, the former changes from descending to ascending.

The author considers that this can only be understood to mean that the constantly operative electromotive forces which find their expression in the persistent difference of potential between the opposite surfaces, and those more transitory ones which are called into momentary existence by touching the sensitive filaments or by

other modes of stimulation, have the same seat, and that the opposition between them is in accordance with a principle applicable in common to the excitable structures of plants and animals, viz., that the *property which renders a structure capable of undergoing excitatory change is expressed by relative positivity, the condition of discharge by relative negativity.*

With reference to the mode of action of the voltaic current, the effect produced in the unexcited leaf is compared with that observed in the unexcited electric organ of the skate or the torpedo, in both of which, as in the leaf, it is observed that, although the after-effect of a current led across the disks or plates is to increase the difference of potential between its two surfaces, whichever way the current is directed, the effect is much greater when the direction of the external current coincides with that of the normal electromotive action of the organ than in the opposite case.

It is further shown that the electromotive changes concerned in "modification" and "excitation" have their seat at the upper surface of the lamina. If, as the author believes, all these changes depend on difference of physiological activity between adjacent excitable cells or strata of cells of which the protoplasmic linings are in continuity, it must be supposed that when the leaf is at its prime, the most superficial strata are positive to those subjacent, and that as the former lose their pristine susceptibility of excitatory change, the physiological, and consequently the electrical, difference between them is diminished, annulled, or reversed.

The fourth section of the paper is devoted to an investigation made in 1887, of the events of the first second after excitation made with the aid of a pendulum-rheotome specially adapted for the purpose. The fifth contains the description of the records obtained by photographing the electric phenomena of the excitatory reaction, as observed with the aid of the capillary electrometer, on rapidly moving plates. Both of these series of observations serve to confirm and complete the results obtained by other methods.

II. "Magnetic Qualities of Nickel." By J. A. Ewing, F.R.S., Professor of Engineering, University College, Dundee, and G. C. Cowan. Received April 26, 1888.

(Abstract.)

The experiments described in the paper were made with the view of extending to nickel the same lines of enquiry as had been pursued by one of the authors in regard to iron ('Phil. Trans.,' 1885, p. 523). Cyclic processes of magnetisation were studied, in which a magnetising